

What is claimed:

1. Apparatus for supporting a load, comprising:

a plurality of pneumatic units;

a plurality of couplers coupled to opposite sides of said load, said couplers
5 moving said load parallel to a first axis responsive to actuation of said plurality of
pneumatic units, at least one of said couplers rotating said load about a second axis
orthogonal to said first axis, said load compliant along said first axis and about said
second axis, at least one of said pneumatic units provides compliance along said first
axis and about said second axis.

10 2. Apparatus for supporting a load according to claim 1, further
comprising a swing plate for moving said load about said first axis.

3. Apparatus for supporting a load according to claim 1, wherein when
said load moves about said second axis, said one of said couplers moves in one
direction while either:

15 a) another of said couplers moves in an opposite direction; or

b) said another of said couplers remains stationary.

4. Apparatus for supporting a load according to claim 1, further comprising an in-out plate, for moving said load parallel to said second axis.

5. Apparatus for supporting a load according to claim 1, further comprising a side to side plate for moving said load along a third axis orthogonal to
5 both said first axis and said second axis.

6. Apparatus for supporting a load according to claim 1, wherein said couplers rotate said load about a third axis orthogonal to said second axis.

7. Apparatus for supporting a load according to claim 1, wherein said load is compliant about said second axis independent of whether said second axis is at a
10 center of gravity of said load.

8. Apparatus for supporting a load according to claim 1, wherein each of said pneumatic units are individually regulated.

9. Apparatus for supporting a load according to claim 1, further comprising a plurality of actuators for moving said pneumatic units to respective first
15 positions, said pneumatic units facilitate movement of said load to a final position.

10. Apparatus for supporting a load, comprising:

a plurality of pneumatic units;

a plurality of couplers coupling said pneumatic units to said load at opposite sides thereof, said pneumatic units providing compliance in at least two degrees of freedom.

11. Apparatus for supporting a load according to claim 10, further
5 comprising a plurality of actuators for moving said load along a first axis, at least one of said couplers moving said load about a second axis responsive to actuation of at least one of said actuators, said pneumatic units causing said load to be compliant along said first axis and about said second axis.

12. Apparatus for supporting a load according to claim 11, further
10 comprising a swing plate for moving said load about said first axis.

13. Apparatus for supporting a load according to claim 11, wherein when said load moves about said second axis, said one of said couplers moves in one direction while either:

- a) another of said couplers moves in an opposite direction; or
- 15 b) another of said couplers remains stationary.

14. Apparatus for supporting a load according to claim 11, further comprising an in-out plate, for moving said load parallel to said second axis.

15. Apparatus for supporting a load according to claim 11, further comprising a side to side plate for moving said load along a third axis orthogonal to said second axis.

16. Apparatus for supporting a load according to claim 11, wherein said
5 couplers rotate said load about a third axis orthogonal to said first and second axis.

17. Apparatus for supporting a load, comprising:

a plurality of columns;

a plurality of main arms moveable along said columns, respectively, for moving said load along a first axis;

10 at least one vernier arm moveable along at least one of said main arms, said vernier arm providing compliance about a second axis orthogonal to said first axis.

18. Apparatus according to claim 17, further comprising a pneumatic unit for allowing movement of said vernier arm.

19. Apparatus according to claim 17, further comprising a coupler coupled
15 to a side of said load, said coupler moveable with said vernier arm, said coupler moves said load along said first axis and about said second axis.

20. Apparatus for supporting a load according to claim 18, further comprising a swing plate for moving said load about said first axis.

21. Apparatus for supporting a load according to claim 19, wherein when said load moves about said second axis, said one of said couplers moves in one
5 direction while either:

a) another of said couplers moves in an opposite direction; or

b) another of said couplers remains stationary.

22. Apparatus for supporting a load according to claim 18, further comprising an in-out plate, for moving said load along said second axis.

10 23. Apparatus for supporting a load according to claim 18, further comprising a side to side plate for moving said load along a third axis orthogonal to said second axis.

24. Apparatus for supporting a load according to claim 18, wherein said coupler rotates said load about a third axis orthogonal to said first and second axes.

15 25. Apparatus for supporting a load, comprising:

a plurality of couplers coupled to said load at opposite sides thereof, at least one of said couplers power driven for rotating said load about a rotation axis, said at least one couplers including an attachment unit having a flexible element for providing compliance about said rotation axis.

5 26. Apparatus for supporting a load according to claim 25, wherein said couplers move said load along a first axis orthogonal to said rotation axis and about a second axis orthogonal to both said first axis and said rotation axis

 27. Apparatus for supporting a load according to claim 26, wherein said load is compliant along said first axis and about said second axis.

10 28. Apparatus for supporting a load according to claim 26, wherein when said load moves about said second axis, said one of said couplers moves in one direction while either:

 a) another of said couplers moves in an opposite direction; or

 b) another of said couplers remains stationary.

15 29. Apparatus for supporting a load according to claim 26, further comprising an in-out plate, for moving said load along said second axis.

30. Apparatus for supporting a load according to claim 26, further comprising a side to side plate for moving said load along said rotating axis which is orthogonal to said second axis.

31. Apparatus for supporting a load according to claim 25, wherein said
5 flexible element comprises rubber.

32. Apparatus for supporting a load according to claim 25, wherein said flexible element is coupled to a power driven gear.

33. Apparatus for supporting a load according to claim 25, wherein said one of said coupler is power driven from a source selected from the group consisting
10 of electricity and pneumatic.

34. A method of supporting a load, comprising:

actuating a plurality of spaced apart actuators to move said load along a first axis;

providing compliant freedom along said first axis; and

15 providing compliant freedom about a second axis orthogonal to the first axis .

35. A method of supporting a load according to claim 34, further comprising the step of moving said load about said first axis.

36. A method of supporting a load according to claim 34, wherein when said load moves about said second axis, one of said actuators moves in one direction
5 while either:

a) another one of said actuators moves in an opposite direction, or

b) said another one of said actuators remains stationary.

37. A method of supporting a load according to claim 34, further comprising the step of moving said load parallel to said second axis.

10 38. A method of supporting a load according to claim 34, further comprising the step of moving said load along a third axis orthogonal to both said first axis and said second axis.

39. A method of supporting a load according to claim 34, further comprising the step of rotating said load about a third axis orthogonal to said second
15 axis.

40. A method of supporting a load according to claim 34, further comprising the step of regulating at least one pneumatic unit to provide compliant freedom.

41. A method of supporting a load according to claim 40 wherein said one
5 pneumatic unit is one of a plurality of pneumatic units that are individually regulated to provide said compliant freedom.

42. A method of supporting a load according to claim 40, wherein said actuators move said at least one pneumatic unit to a first position, and said pneumatic unit facilitates movement of said load to a final position.

10 43. A method of docking a test head to a peripheral, said method comprising the steps of:

- a) moving said test head towards said peripheral;
- b) inserting docking members coupled to said test head into pin receptacles coupled to said peripheral;
- 15 c) moving said pin receptacles so that said docking members are pulled further into said pin receptacles in order to dock said test head and said peripheral.

44. A method of docking a test head to a peripheral according to claim 43, wherein one of said docking members includes a cam follower, and step c) includes the step of sliding said pin receptacle so that said cam follower moves along a groove in said pin receptacle in order to dock said test head and said peripheral.

5 45. The method of claim 44, wherein said pin receptacle slides under power.

46. The method of claim 44, wherein movement of a piston causes said pin receptacle to slide.

47. The method of claim 44, wherein said pin receptacle slides as a result
10 of rotation of an arm.

48. The method of claim 44, wherein force is applied to one end of an arm which rotates about a pivot point so that another end of said arm slides said pin receptacle.

49. The method of claim 44, wherein said groove follows a path extending
15 between sides of said pin receptacle with one end of said path deeper into said pin receptacle than another end of said path.

50. A docking mechanism for docking a test head with a peripheral, comprising:

a first alignment feature and a graspable engagement element attached to one of the test head and the peripheral, and

a docking module attached to the other of the test head and the peripheral, comprising:

5 a) an alignment receptacle for receiving the alignment feature,

 b) a movable grasping member for receiving and grasping the graspable engagement element, said grasping member movable from a first position where the graspable element is received to a second position where the Graspable element (?) has been pulled, thus docking the test head and the peripheral,

10 c) a detector for detecting when the graspable element is in a position to be grasped,

 d) an actuator for moving the movable grasping member in order to move the graspable element from a first position to a second position in order to dock said test head and said peripheral.

15 51. A docking mechanism according to claim 50, wherein movement of said graspable element from said first position to said second position is linear.

52. A docking mechanism according to claim 50 wherein movement of said grasping element is linear.

53. A docking mechanism according to claim 51 wherein the movement of said graspable element is substantially perpendicular to the movement of said
5 grasping element.

54. A docking mechanism according to claim 52 wherein the movement of said graspable element is substantially perpendicular to the movement of said grasping element.

55. A docking mechanism according to claim 50, wherein said actuator is a
10 linear actuator which moves along a linear path.

56. A docking mechanism according to claim 50, wherein said actuator is pneumatic.

57. A docking mechanism according to claim 50, wherein said actuator is an electrical solenoid.

15 58. A docking mechanism according to claim 50, wherein said graspable element is a cam follower and said grasping member includes a cam.

59. A docking mechanism according to claim 50, wherein said detector is one of a pneumatic switch and an electrical switch.

60. A docking mechanism according to claim 50, wherein said module is adjustable relative to said test head or said peripheral to which said module is
5 mounted in an X, Y and Z direction.

61. A docking module comprising:

a feature detector for detecting a feature,

a movable feature receptacle; and

an actuator which, responsive to detection of said feature, moves a moveable
10 feature of said moveable feature receptacle to capture said feature and pull said feature in a linear direction.

62. A docking module according to claim 61, wherein said docking module is one of a plurality of docking modules which are coupled to one of a test head and a peripheral, and said feature is one of a plurality of features coupled to the other of
15 said test head and said peripheral, actuation of each actuator causes said test head to be docked to said peripheral.

63. A docking module according to claim 61, wherein said actuator is a linear actuator

64. A docking module according to claim 61, wherein said actuator is pneumatic.

5 65. A docking module according to claim 61, wherein said actuator is an electrical solenoid.

66. A docking module according to claim 61, wherein said moveable feature moves perpendicular to said linear direction.

67. A docking module according to claim 61, wherein said module feature
10 is moved along a linear path.

68. A docking module according to claim 61, wherein said feature is a cam follower and said moveable feature receptacle includes a cam.

69. A docking module according to claim 61, wherein said feature detector is one of a pneumatic switch and an electrical switch.

15 70. A docking module according to claim 62, wherein said module is adjustable relative to said one of said test head and said peripheral in an X, Y and Z direction.

71. A method of docking a test head to a peripheral, comprising the steps of:

inserting a docking pin coupled to said test head into a pin receptacle coupled to said peripheral, said docking pin including a cam follower situated on at least one
5 side of said docking pin;

sliding said pin receptacle so that said cam follower moves along a groove in said pin receptacle in order to move said test head towards said peripheral.

72. The method of claim 71, wherein said pin receptacle slides under power.

10 73. The method of claim 71, wherein movement of a piston causes said pin receptacle to slide.

74. The method of claim 71, wherein said pin receptacle slides as a result of rotation of an arm.

75. The method of claim 71, wherein force is applied to one end of an arm
15 which rotates about a pivot point so that another end of said arm slides said pin receptacle.

76. The method of claim 71, wherein said groove follows a path extending between sides of said pin receptacle with one end of said path deeper into said pin receptacle than another end of said path.

77. A method of docking a test head to a peripheral, said method
5 comprising the steps of:

a) actuating a driving unit coupled to the test head to push the test head towards the peripheral;

b) actuating a further driving unit coupled to one of the test head and the peripheral to pull the test head towards the peripheral;

10 wherein step a) and step b) overlap for a period of time.

78. A method of docking a test head to a peripheral according to claim 77, wherein step b) is initiated responsive to said test head being in a predetermined position while step a) is being performed.

79. A method of docking a test head to a peripheral according to claim 78,
15 wherein, in said predetermined position, docking members coupled to one of the test head and the peripheral are aligned with pin receptacles coupled to the other of the test head and the peripheral.

80. A method of docking a test head to a peripheral according to claim 79, wherein in said predetermined position, said docking members are in said pin receptacles.

81. A method of docking a test head to a peripheral according to claim 77,
5 wherein at the end of said period of time, actuating of said driving unit is terminated.

82. A method of docking a test head to a peripheral according to claim 77, wherein at the end of said period of time, brakes applied to said driving unit are released.

83. A method of docking a test head to a peripheral according to claim 77,
10 further comprising the step of mating respective electrical contacts on said test head and said peripheral after step b) has been initiated.

84. A method of docking a test head to a peripheral according to claim 77, wherein brakes are applied to said driving unit prior to performing step b)